

## METHOD FOR PRODUCTION OF HIGH PRESSURE STEAM FROM PRODUCED WATER

### ABSTRACT

An evaporation based method for generation of high pressure steam from  
5 produced water in the heavy oil production industry. De-oiled produced water is  
processed through a high pH/high pressure evaporator driven by a commercial  
watertube boiler. The vapor produced by the evaporator is suitable for the steam  
assisted gravity drainage (SAGD) method being utilized by heavy oil recovery  
installations, without the use of once through steam generators that require  
10 extensive chemical treatment, and without requiring atmospheric distillation, which  
requires high power consuming compressors. Evaporator blowdown may be  
further treated in a crystallizing evaporator to provide a zero liquid discharge  
(ZLD) system and, with most produced waters, at least 98% of the incoming  
produced water stream can be recovered in the form of high pressure steam.